[6450-01-P]

DEPARTMENT OF ENERGY

Notice of Availability of Final Versatile Test Reactor Environmental Impact Statement

AGENCY: Office of Nuclear Energy, Department of Energy.

ACTION: Notice of availability.

SUMMARY: The U.S. Department of Energy (DOE or the Department) announces the availability of the *Final Versatile Test Reactor Environmental Impact Statement* (VTR EIS) (DOE/EIS-0542). DOE prepared the VTR EIS in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential environmental impacts of alternatives for constructing and operating VTR and associated facilities for post-irradiation examination of irradiated test specimens and the management of VTR spent nuclear fuel. The Final VTR EIS also evaluates the potential environmental impacts of options for production of VTR driver fuel (the fuel that powers the reactor).

DATES: DOE will issue a Record of Decision based on the VTR EIS no sooner than 30 days after the May 20, 2022, publication of the U.S. Environmental Protection Agency notice of availability of the Final VTR EIS in the *Federal Register*. For alternatives (or options) for which DOE did not identify a preferred alternative (or option) in the Final VTR EIS, DOE will not issue a Record of Decision until 30 days after it announces its preferred alternative (or option) in the *Federal Register.*

ADDRESSES: Communications regarding the Final VTR EIS should be sent to Mr. James Lovejoy, Document Manager, by mail to: U.S. Department of Energy, Idaho Operations Office, 1955 Fremont Avenue, MS 1235, Idaho Falls, Idaho 83415; or by e-mail to *VTR.EIS@nuclear.energy.gov*. The Final VTR EIS is available for viewing or download at *https://www.energy.gov/nepa* or *https://www.energy.gov/ne/versatile-test-reactor*.

FOR FURTHER INFORMATION CONTACT: For information regarding the VTR Project or the Final VTR EIS, *visit https://www.energy.gov/ne/versatile-test-reactor.*

For questions about the Final VTR EIS or the analyses therein, contact Mr. James Lovejoy at the mailing address listed in **ADDRESSES**; via email at *VTR.EIS@nuclear.energy.gov*; or call (208) 526-6805. For general information on DOE's NEPA process, contact Mr. Jason Anderson at the mailing address listed in **ADDRESSES**; via email at *VTR.EIS@nuclear.energy.gov*; or call (208) 526-6805.

SUPPLEMENTARY INFORMATION:

Background

Part of the DOE mission is to ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions. Many commercial organizations and universities are pursuing advanced nuclear energy fuels, materials, and reactor designs that complement the efforts of DOE and its laboratories in advancing nuclear energy. These designs include thermal and fast-spectrum[1] reactors targeting improved fuel resource utilization and waste management and utilizing

[1] Fast neutrons are highly energetic neutrons (ranging from 0.1 to 10 million electron volts [MeV] and travelling at speeds of thousands to tens of thousands kilometers per second) emitted during fission. The fast-neutron spectrum refers to the range of energies associated with fast neutrons. By contrast, thermal neutrons, such as those typically associated in a commercial light-water reactor, are neutrons that are less energetic than fast neutrons (more than a million times less energetic [about 0.25eV] and travelling at speeds of less than 5 kilometers per second), having been slowed by collisions with other materials such as water. The thermal neutron spectrum refers to the range of energies associated with thermal neutrons.

materials other than water for cooling. Development of these designs requires adequate infrastructure for experimentation, testing, design evolution, and component qualification. Existing irradiation test capabilities are aging and some are over 50 years old. The existing capabilities are focused on testing of materials, fuels, and components in the thermal neutron spectrum and do not have the ability to support the needs of fast reactor researchers. Only limited fast-neutron-spectrum-testing capabilities, with restricted availability, exist outside the United States. To meet its obligation to support advanced reactor technology development, DOE needs to develop the capability for large-scale testing, accelerated testing, and qualification of advanced nuclear fuels, materials, instrumentation, and sensors. This testing capability is essential for the United States to modernize its nuclear energy infrastructure and for developing transformational nuclear energy technologies that will play a crucial role in helping the United States reach net-zero emissions by 2050 while re-establishing the United States as a world leader in nuclear technology commercialization.

Recognizing that the United States does not have a dedicated fast-neutron-spectrum testing capability, DOE performed a mission needs assessment to evaluate current testing capabilities (domestic and foreign) against the required testing capabilities to support the development of advanced nuclear technologies. This needs assessment was consistent with the Nuclear Energy Innovation Capabilities Act (NEICA) (Pub. L. No. 115-248) passed in 2018, which directed DOE to assess the mission need for, and cost of, a versatile reactor-based fast-neutron source with a high neutron flux, irradiation flexibility, multiple experimental environment (e.g., coolant) capabilities, and volume for many concurrent users. The needs assessment identified a gap between required testing needs and existing capabilities. That is, there currently is an inability to effectively test advanced nuclear fuels and materials in a fast-neutron spectrum irradiation environment at high neutron fluxes. Specifically, the DOE Office of Nuclear Energy (NE), Nuclear Energy Advisory Committee (NEAC) report, *Assessment of Missions and Requirements for a New U.S. Test Reactor*, confirmed that there was a need in the United States for fast-neutron testing capabilities, but that there is no facility that is readily available domestically or internationally. The NEAC study confirmed the conclusions of an earlier study, the *Advanced Demonstration and Test Reactor Options Study*. That study established the strategic objective that DOE "provide an irradiation test reactor to support development and qualification of fuels, materials, and other important components/items (e.g., control rods, instrumentation) of both thermal and fast neutron-based advanced reactor systems."

Following establishment of the mission need described previously, the VTR Project was formally launched in February 2019 as a part of the effort to modernize the nuclear research and development user facility infrastructure in the United States. In later 2020, Congress enacted the Energy Act of 2020. This legislation, contained within the Consolidated Appropriations Act, directs the Secretary to provide a fast-neutron testing capability and revised the completion date from 2025 to 2026.

The Department is committed to reviving and expanding the nuclear energy infrastructure in the United States. An important step to achieving this goal is building the VTR in a manner that is protective of the public and the environment. DOE is announcing the Final VTR EIS to meet the intent of NEICA and to comply with the Council on Environmental Quality's *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*, which require agencies to "integrate the NEPA process with other planning at the earliest possible time to insure that planning and decisions reflect environmental values, to avoid delays later in the process, and to head off potential conflicts" (40 CFR 1501.2).

Alternatives

In addition to a No Action Alternative, the Final VTR EIS evaluates potential environmental impacts of alternatives for constructing and operating a VTR. Under the action alternatives, the VTR would be a small (approximately 300 megawatt thermal) sodium-cooled, pool-type, metal-fueled reactor. DOE has completed a conceptual design of a fast-neutron-spectrum reactor based on the Power Reactor Innovative Small Module (PRISM) design from GE-Hitachi. In addition to constructing and operating the VTR, the action alternatives include the activities necessary to perform post-irradiation examination of test specimens and for the management of spent nuclear fuel from the VTR. After irradiation in the VTR, test specimens/experimental cartridges would be transferred to post-irradiation examination facilities where they would be disassembled so that the specimens can undergo detailed evaluation. To the extent practical, DOE would make use of existing facilities to perform post-irradiation examination. Spent driver fuel would be removed from the VTR each year over its 60-year operating life. The fuel would be treated (to remove sodium that is used as a bonding material in fabrication of the fuel) and packaged in containers that are ready for transport to an offsite storage facility or repository; no fissile material would be recovered during this treatment process. Pending shipment offsite, the packaged spent nuclear fuel would be stored at a facility provided by the VTR project. These activities would be part of each action alternative. The alternatives evaluated include establishing the VTR and support activities at the Idaho National Laboratory (INL) or the Oak Ridge National Laboratory (ORNL).

Idaho National Laboratory Versatile Test Reactor Alternative

Under the INL VTR Alternative, DOE would site the VTR adjacent to the Materials and Fuels Complex (MFC) at INL and use existing hot cell and other facilities at the MFC for post-irradiation examination. The MFC is the location of the Hot Fuel Examination Facility (HFEF), the Irradiated Materials Characterization Laboratory (IMCL), the Experimental Fuels Facility (EFF), and other laboratory facilities. Spent driver fuel would be treated at the Fuel Conditioning Facility (FCF) and stored at a facility constructed as part of the VTR project. The INL VTR Alternative is DOE's preferred alternative.

Oak Ridge National Laboratory Versatile Test Reactor Alternative

Under the ORNL VTR Alternative, the VTR would be sited at ORNL at a location about three quarters of a mile northeast of the High Flux Isotope Reactor. In addition to constructing the VTR and a facility to store spent driver fuel, DOE would also construct a new hot cell facility at this location. The hot cell facility would include capability and capacity for the initial post-irradiation disassembly and examination of test specimens and for the treatment of spent VTR driver fuel. Several existing facilities at ORNL would be used to provide additional post-irradiation examination capabilities. Hot cells in the Irradiated Fuels Examination Laboratory and the Irradiated Materials Examination and Testing Facility would augment the capabilities in the new hot cell facility. In addition, the Low Activation Materials Design and Analysis Laboratory would be used for testing low-dose samples that do not require the use of hot cells.

Reactor Fuel Production

The driver fuel for the VTR would be a metal alloy composed of uranium, plutonium, and zirconium. Activities to produce reactor fuel may include feedstock preparation, as well as fuel fabrication. The Final VTR EIS evaluates the potential environmental impacts of a number of feedstock preparation activities that would be used to remove contaminants from the plutonium (called polishing) and to convert plutonium oxides to metal that can be used in fuel fabrication. The fabrication steps include creating the alloy; casting the alloy to create fuel slugs; fabricating fuel pins, including establishing a sodium bond between the fuel slugs and the encasing tube; and assembling the tube bundles that would be placed in the reactor. DOE evaluates two options for each phase of reactor fuel production. The feedstock preparation could be performed at either INL or the Savanah River Site (SRS). Similarly, fuel fabrication activities could be performed at INL or SRS.

Under the options to perform feedstock preparation and fuel fabrication at INL, new and existing gloveboxes and equipment would be used in the Fuel Manufacturing Facility and the building that previously housed the Zero Power Physics Reactor. Under the options to perform feedstock preparation and fuel fabrication at SRS, new gloveboxes and equipment would be installed in a building that previously housed one of the SRS production reactors. DOE has not identified a preferred option for reactor fuel production.

Public Involvement

The Final VTR EIS follows the December 2020 release of the Draft VTR EIS (85 FR 83068). The U.S. Environmental Protection Agency published its notice of availability on December 31, 2020 (83 FR 86919). DOE accepted comments through March 2, 2021. During the review and comment period, DOE held two web-based public hearings. DOE received comments from Federal and state agencies, American Indian tribes, and the public. In preparing the Final EIS, DOE considered and responded to the comments received on the Draft EIS. Responses to all comments are included in Volume 3 of the Final VTR EIS.

Signing Authority

This document of the Department of Energy was signed on May 12, 2022, by Robert Boston, DOE Idaho Operations Office Manager, Office of Nuclear Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on May 13, 2022.

Treena V. Garrett,
Federal Register Liaison Officer,
U.S. Department of Energy.
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